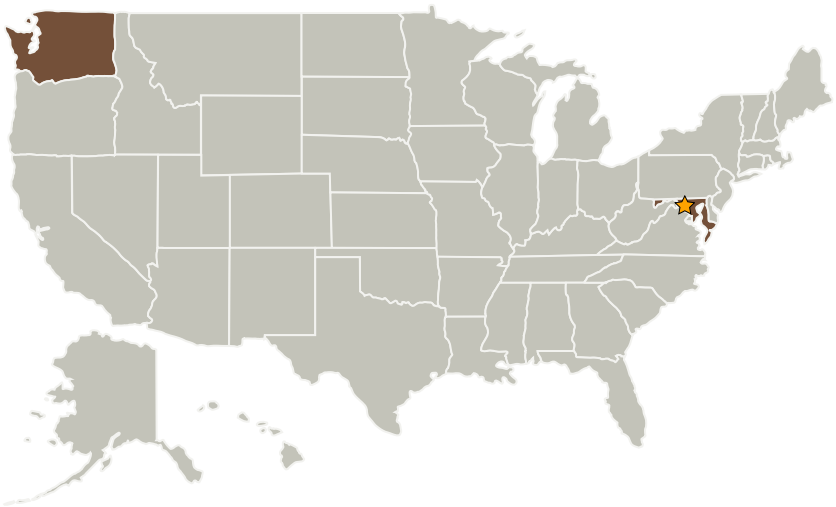
# Superconducting Thin-Film Interconnects for Cryogenic Photon Detector Arrays, Phase II

Completed Technology Project (2006 - 2008)

## Project Introduction

Next generation astrophysical observatories need improvements in readout electronics and associated high density interconnects. In particular, advanced imaging spectrometers for x-ray astronomy will require significant improvements in the high density interconnects between the detector arrays and the first stage electronics. These detectors operate at 50 to 100 mK, while the first stage is held between 1.3 and 1.5 K. Interconnects are needed that provide the required signal paths while imparting a total thermal heat load on the detector stage of less than 0.5 microwatts. The innovation proposed to meet this need is an ultra-thin polyimide membrane supporting a high-density array of vacuum-deposited superconducting traces. During Phase I, 100-trace Niobium arrays were deposited on ultra-thin polyimide films. The critical current density (Jc) averaged 2.1 x 106 A/cm2, exceeding Phase I goals and demonstrating the feasibility of the innovation. This result suggests that interconnects with 1000 traces are feasible within specified heat load limits and the goal of Phase II will be to produce such interconnects for both NASA and commercial applications. The proposed interconnects greatly broaden the thermal budget/signal capacity envelope for low-temperature detector applications by combining existing lithographic technology with Luxel's state-of-the-art thin film processes and mission tested polyimide.

## Primary U.S. Work Locations and Key Partners




Superconducting Thin-Film Interconnects for Cryogenic Photon Detector Arrays, Phase II

## Table of Contents



## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

**Small Business Innovation Research/Small Business Tech Transfer**

# Superconducting Thin-Film Interconnects for Cryogenic Photon Detector Arrays, Phase II

Completed Technology Project (2006 - 2008)

| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Goddard Space Flight Center(GSFC) | Lead Organization | NASA Center | Greenbelt, Maryland |
| Luxel Corporation | Supporting Organization | Industry<br>Small Disadvantaged Business (SDB) | Friday Harbor, Washington |

| Primary U.S. Work Locations | |
|---|---|
| Maryland | Washington |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes